REMARKS

The official action of 18 February 2009 has been carefully considered and reconsideration of the application as amended is respectfully requested.

The courtesy of the Examiner in renumbering the claims to take account of the duplicate numbering of claim 11 is gratefully acknowledged. To avoid any confusion, Applicants have canceled renumbered claims 12-21 and rewritten them as new claims 22-31. Applicants have also added new claims 32-33 more completely to define the subject matter which Applicants regard as their invention. Support for the recitations in these claims appears in the specification as filed at, for example, page 2, lines 24-28.

The claims stand rejected under 35 USC 103(a) as allegedly being obvious over Goldstein et al in view of Cassidy or over this combination of references further in view of Oohara. Applicants respectfully traverse these rejections.

The claimed invention is based at least in part upon Applicants' discovery of a way to eliminate the drawbacks of the prior art methods of removing carbon dioxide from the air used in an alkaline fuel cell that does not involve a high consumption of energy or labor and that does not involve replacement of containers (see Background section of present specification for a discussion of these drawbacks). In particular, Applicants found that, with the claimed absorbents and with the use of spent air from a fuel cell that is properly heated, it is possible to eliminate these drawbacks by using the spent air for regenerating *in situ* the

absorbents that are used for the removal of the carbon dioxide.

In the claimed invention, hydrated oxides of transition metals are used as an adsorbent, and the regeneration of the adsorbent is carried out without its recovery from the adsorber by blowing a stream of air exiting fuel cells and having the relative humidity 15 - 85%, a temperature of 60 - 120°C and practically containing no CO_2. The regeneration of the adsorbent is carried out directly in the adsorber. The method for the regeneration is distinguished by simplicity and low power inputs, since the required level of temperatures is essentially low. Moreover, the air exiting the fuel cell is already heated to a temperature of 50 - 80°C.

It should be noted that, for devices generating electric energy, the level of its expenditures for its own needs, in this case for purifying air from CO_2 essentially affects its coefficient of efficiency. The coefficient of efficiency is one of the main parameters determining the expediency of using one or another electrogenerating device. As discussed below, the claimed solution is much more efficient that the solution provided by the primary reference.

The cited references, either alone or in combination, do not show or suggest the features of the invention as claimed. Thus, whereas each of the method claims requires that the recited absorbent comprising hydrated oxides of transition metals be regenerated by the air spent in a fuel cell and each of the product claims requires a pipeline for conducting air spent in the fuel cell back to the absorbents so as to be able to effect such regeneration,

neither of the references shows or suggests these claimed features.

To the contrary, in the primary reference, the regeneration of the adsorbent (a solid or liquid hydroxide of a Group 1A metal) is carried out by removing spent CO_2 absorbent material from its container and then regenerating the removed material by decomposition of carbonates at a temperature of 900 - 1400°C and subsequent hydrolysis of the obtained oxide with water. There is nothing in the reference that would show or suggest using air spent in the fuel cell for this regeneration and indeed the arrows in the embodiments of the Goldstein reference depicted in Figs. 1 and 4 show that air entering the inlet 38 passes through the removable containers 20a, b, c containing absorbent 22 and then passes into and through battery 12 whereupon it exits without passing (and without a pipeline for passing) back to containers 20a, b, c.

Moreover, since Goldstein's scrubber system operates on the principle that the containers should be removed from the system to effect the regeneration, a modification of the system to effect regeneration *in situ* with spent air from the fuel cell would constitute an impermissible change in the principle of operation of Goldstein. See MPEP 2143.01(VI) ("If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious.").

The secondary reference could not supplement the above deficiencies in the primary reference in any event. Cassidy describes a system of purifying air from nuclear,

biological and chemical agents so that the air is fit for breathing by a human. The regeneration of the mesoporous carbon and zeolite absorbers described therein is carried out by air that is **not** purified of CO_2. Indeed, Cassidy describes only the removal of chemical and biological agents that would interfere with breathing (see Cassidy at paragraphs [0004] and [0005]), and one of skill in the art would **not** understand this to include CO_2, which is a constituent of air and is not required to be removed to facilitate breathing. In any event, the reference does not show or suggest the regeneration of an adsorbent by a stream of air coming from a fuel cell or a pipeline passing from an outlet of a fuel cell to an absorbent for such purpose.

Since the cited references, either alone or in combination, do not show or suggest the aforementioned features of the claimed invention, they cannot be considered to set forth a *prima facie* case of obviousness for the invention defined in any of the claims of record for at least this reason.

With specific respect to the method claims, these claims are additionally patentable in that they require that the absorbent be regenerated at a temperature of 60-120°C. The Examiner considers this to be a mere optimization of a range, but this contention is respectfully belied by the teachings of the Goldstein reference. In Goldstein, the regeneration of the adsorbent is carried out by decomposition of carbonates at a temperature of 900 - 1400°C and subsequent hydrolysis of the obtained oxide with water. The indicated regeneration method is a complex one and requires large power inputs. It is inconceivable that Goldstein et al would have taught a method necessitating such a large consumption of

energy if it were possible routinely to practice their method at the claimed temperatures. Accordingly, Applicants respectfully submit that the teachings in Goldstein show in and of themselves the fallacy in the Examiner's contention. See MPEP 2144.05(III) ("A prima facie case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention.").

With specific respect to claims 2 and 10, which require that the spent air for regenerating the absorbent have a relative humidity of from 15 to 85%, the claims are additionally patentable because the references teach away from this claim limitation. Specifically, Cassidy teaches that, for the regeneration of zeolite, the dry air (containing CO_2) is heated to 180 - 190°C (column [0034]). Ordinary air containing CO_2 and heated to 180 - 190°C is extremely dry and would have a detrimental effect on possible regeneration of the absorbent. See specification at first full paragraph on page 4.

In view of the above, Applicants respectfully submit that the cited references are incompetent to set forth even a prima facie case of obviousness for the invention as defined in the claims presently of record. Accordingly, Applicants respectfully submit that all of the rejections and objections of record have been overcome and that the application is now in allowable form. An early notice of allowance is earnestly solicited and is believed to be fully warranted.

Respectfully submitted,

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